Whitetopping Research

Paul Sebenik, PE
Velvet Li, EIT
Materials Group, ADOT

What is Whitetopping?

- Placement of high strength, fiber-reinforced, portland cement concrete over a distressed asphalt.
- Resulting in:
  - long life
  - durability
  - competitive cost

First Experimentation

1991 Louisville, Kentucky landfill access road tests

- **Conditions:**
  - **2 in & 3.5 in thickness**
  - **2 ft & 6 ft joint spacing**
  - **accelerated heavy loading**

First Experimentation

- **Results:**
  - **Ultra Thin Whitetopping good for low-volume, residential streets, and parking lots**
  - **Ultra Thin Whitetopping is expected to perform well under moderately heavy loads**
  - **Concrete can bond to existing asphalt, reducing stresses in concrete layer**
  - **Slipform paving equipment can place mix with fibers as thin as 2 inches**
  - **Rigid pavement theories apply**

ADOT Whitetopping Research

ADOT Phoenix Maintenance
ADOT Phoenix Maintenance Parking Lot

May 2001

Objective:

Test performance of various materials in combination with portland cement

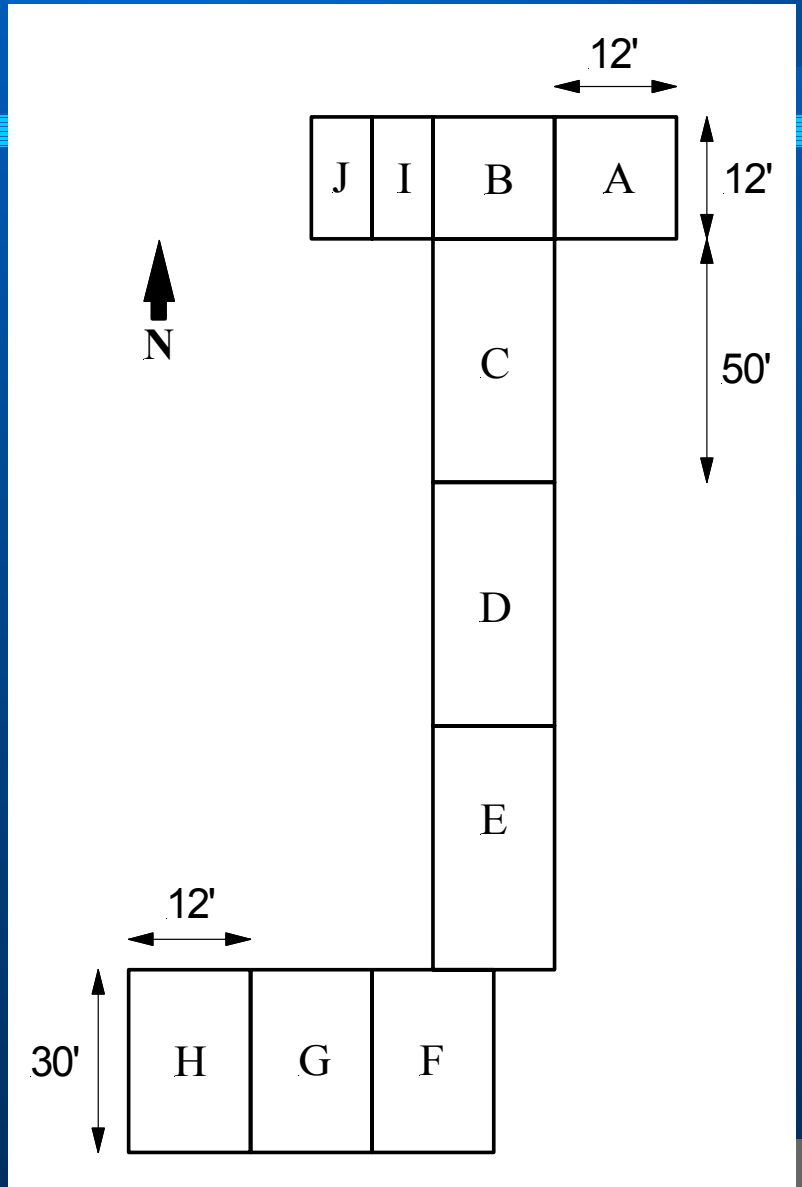
Mixtures: crumb rubber, polypropylene fibers, chemical admixture (Eclipse)

Who Made It Happen

- Doug Forstie,
  George Way
  ADOT Materials
- John Hauskins,
  Craig Cornwell and
  others at Phoenix
  District Maintenance
- Jim Willson, Arizona
  Cement Association
- McNeil Bros. Const.
  Company
- Paul Burch, Phoenix
  Materials Lab
- Vulcan Matls
- Fibermesh
- W.R. Grace
- RPA/Landstar

Where Did It All Happen

Where Did It All Happen?



ADOT Phoenix Maintenance Parking Lot

22nd Ave & Hilton

Phoenix, AZ

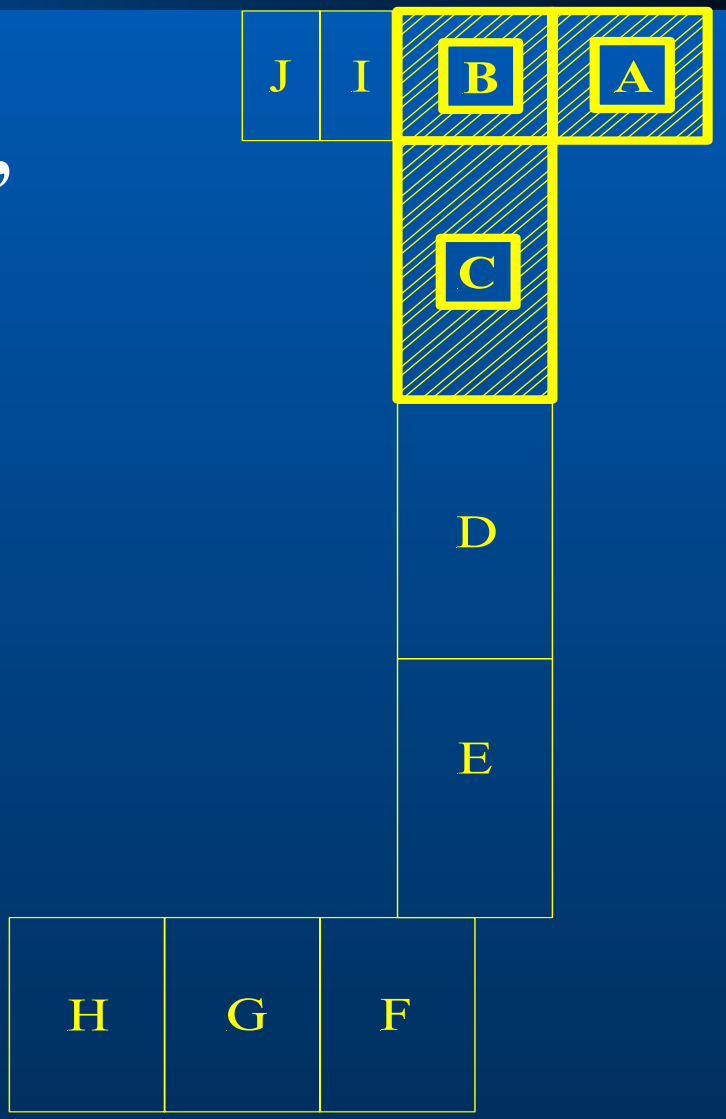
10 sections

Design Sections

A: 40 lbs crumb rubber/CY,
12” thickness

B: standard concrete,
12” thickness

C: 3 lbs Fibermesh
polypropr fibers/CY,
joints at 4’ centers,
4” thickness

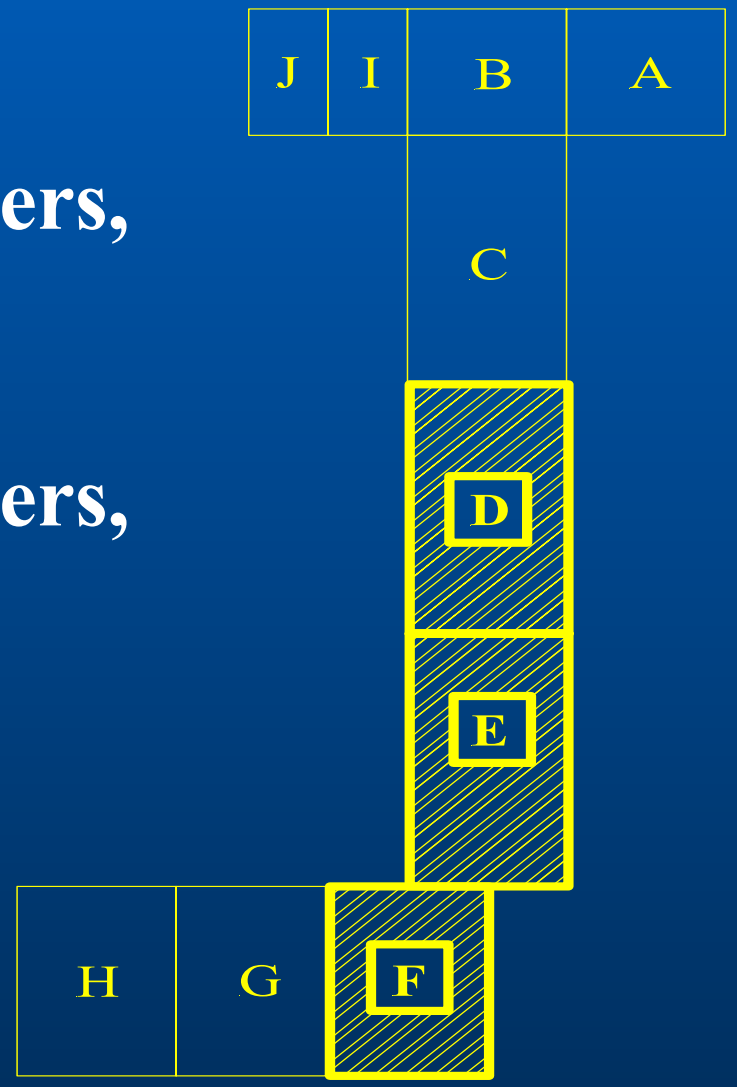


Design Sections

D: 3 lbs Fibermesh polypropr fibers/CY, joints at 3’ centers, 3” thickness

E: 3 lbs Fibermesh polypropr fibers/CY, joints at 3’ centers, 2” thickness

F: 3 lbs Fibermesh polypropr fibers/CY, Grace Eclipse, joints at 6’ centers, 3” thickness



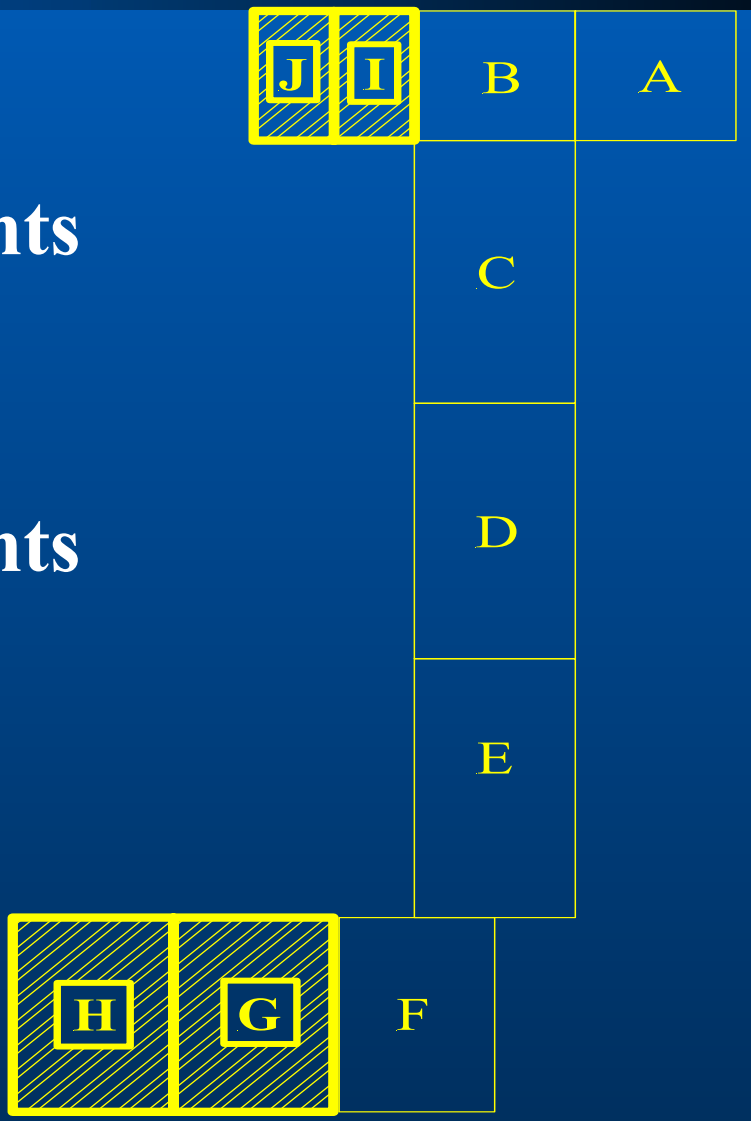
Design Sections

G: 10 lbs Fibermesh Structural fibers/CY, Grace Eclipse, joints at 6’ centers, 3” thickness

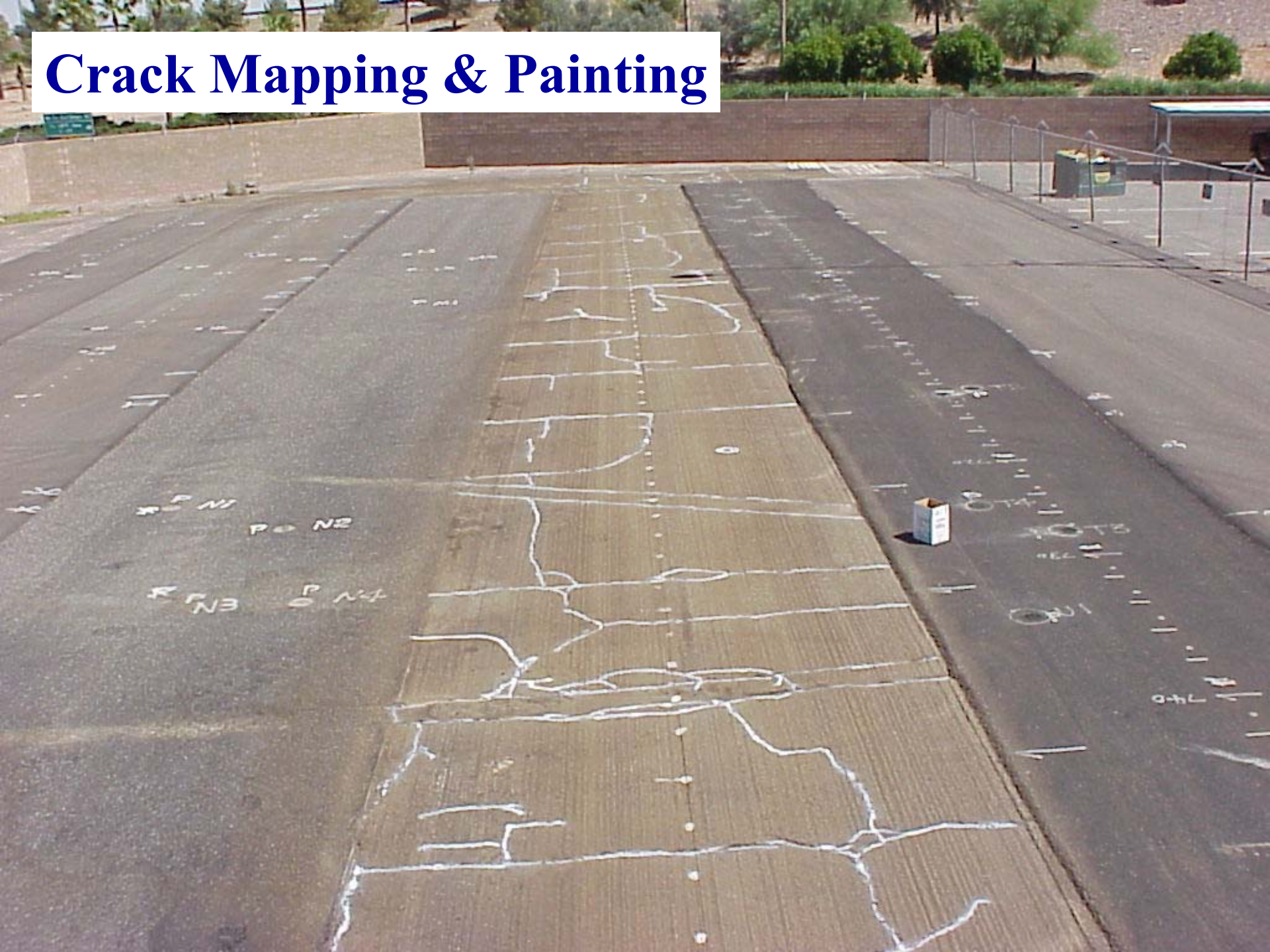
H: 10 lbs Grace Structural fibers/CY, Grace Eclipse, joints at 6’ centers, 3” thickness

I: same as G with 12” thickness

J: same as H with 12” thickness



Crack Mapping & Painting



Crack Mapping & Painting

3/4” Milling


3/4” Milling

Forming Test Sections

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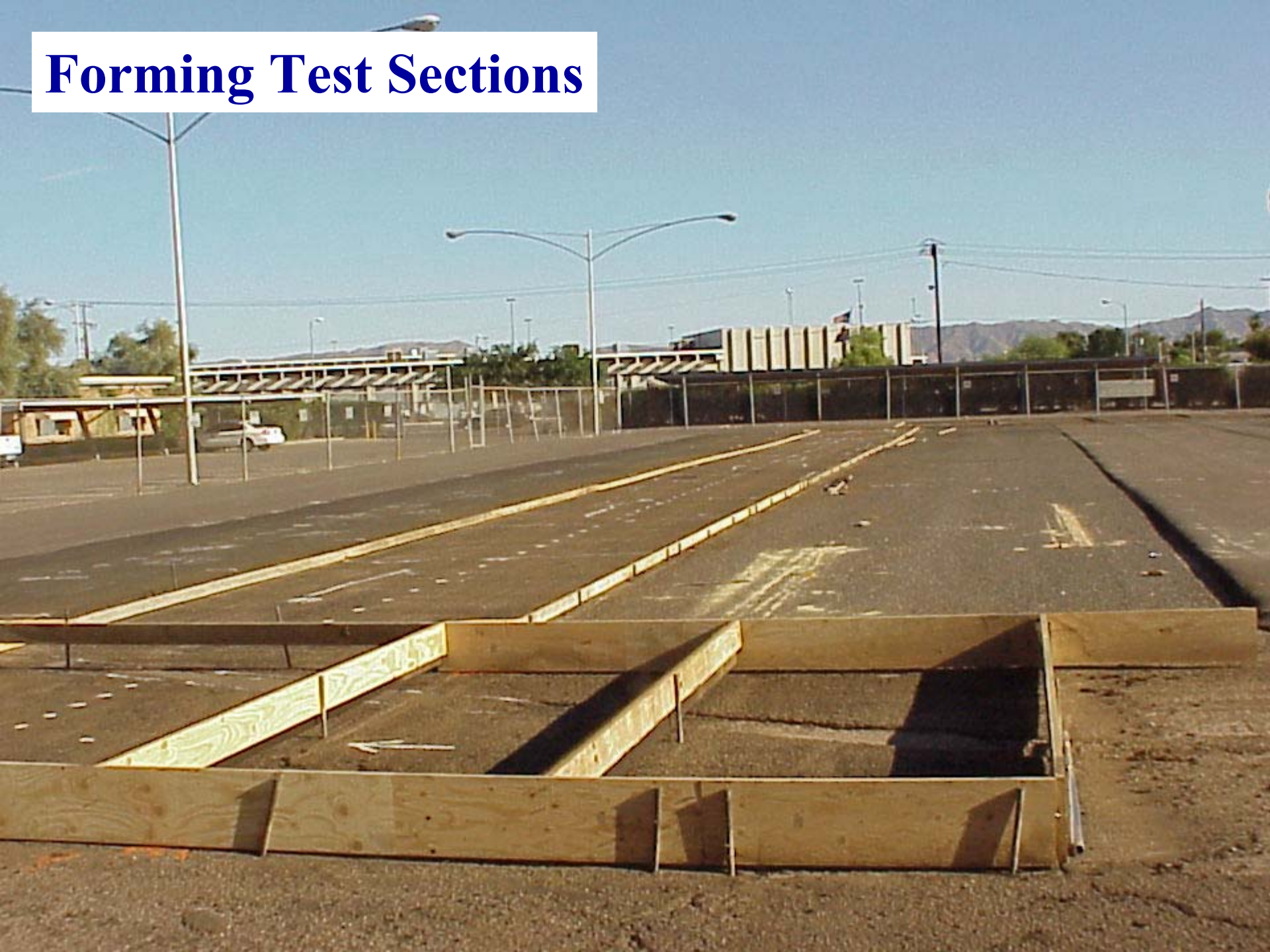
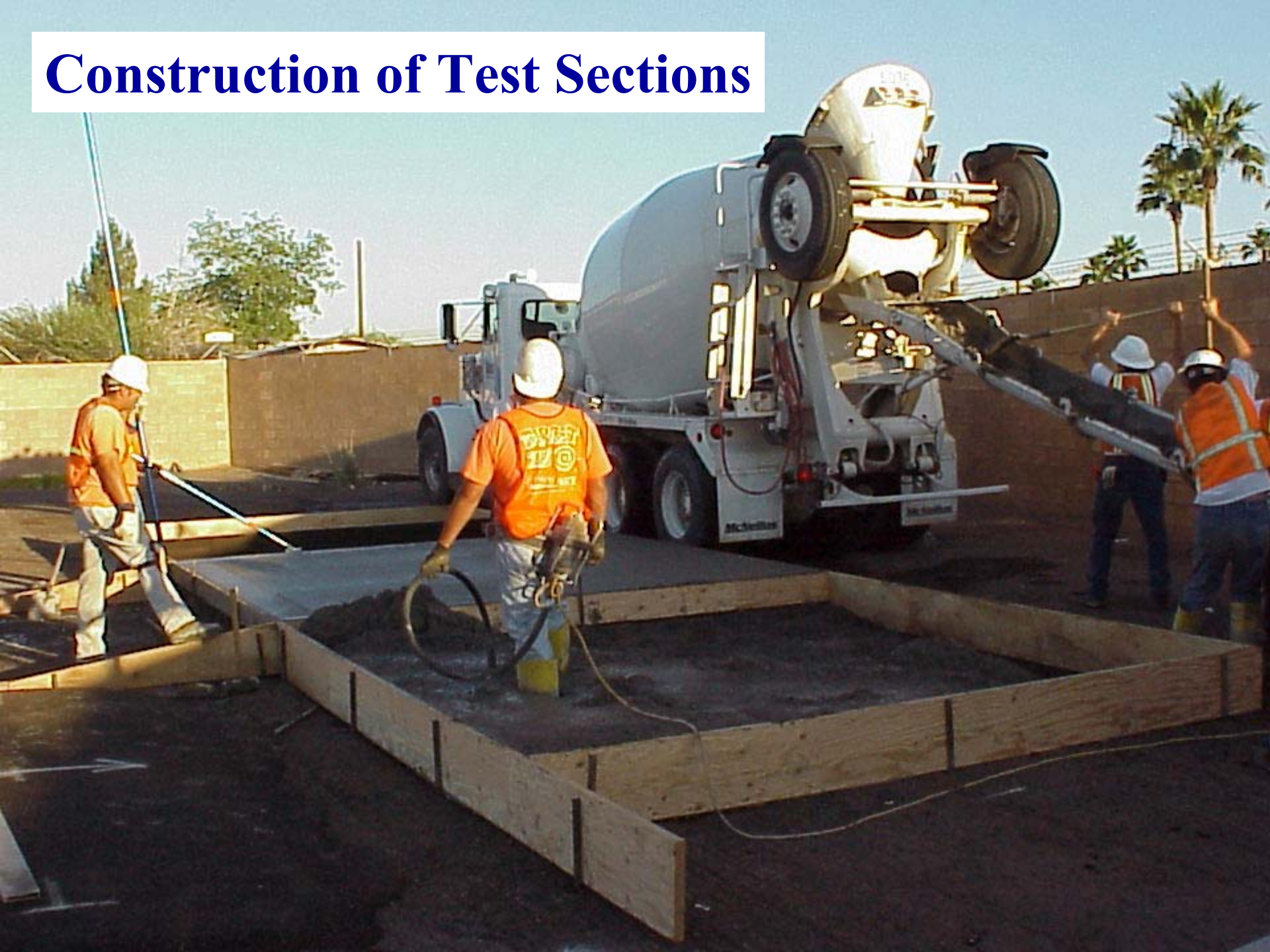


Construction of Test Sections



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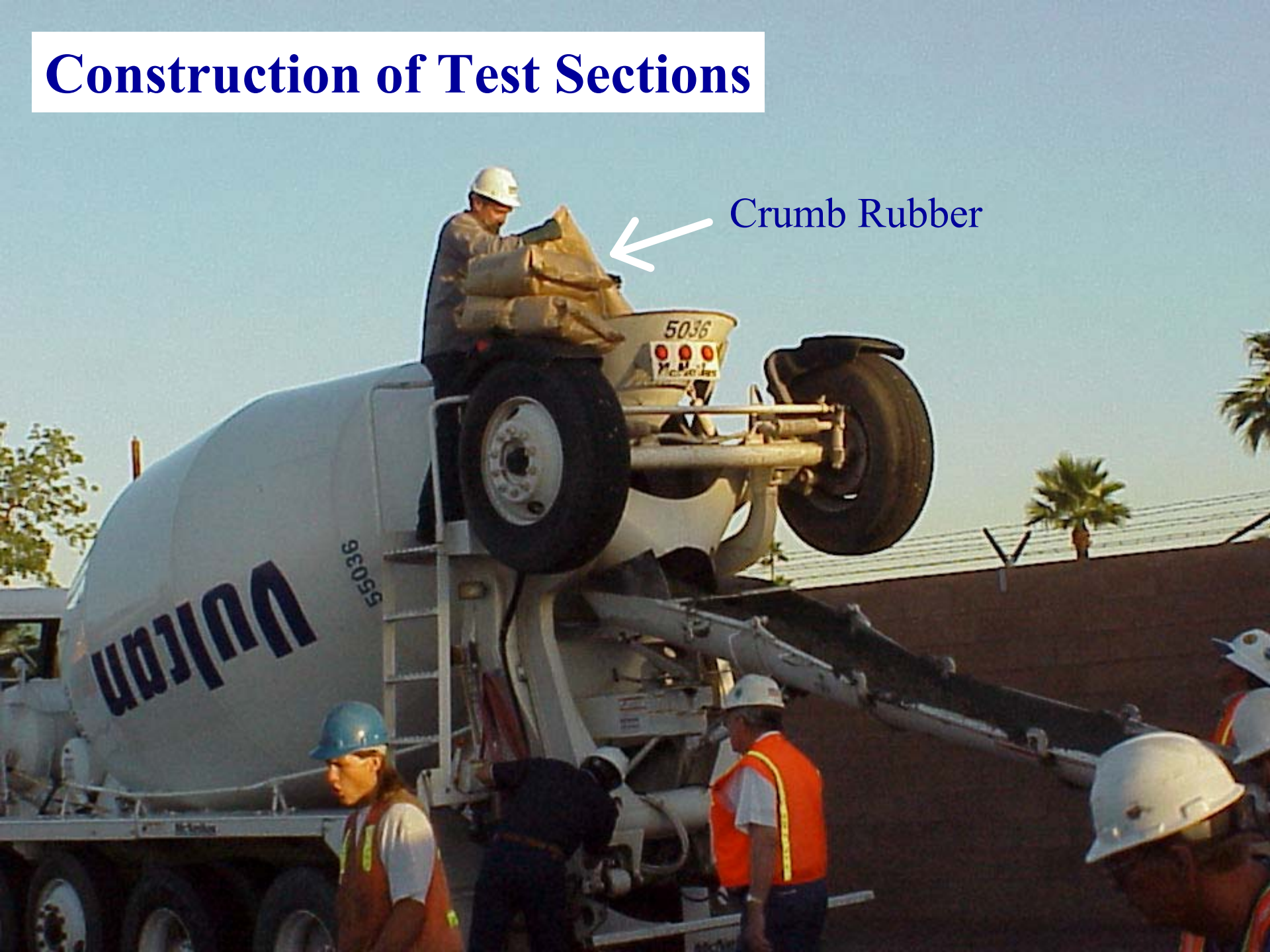
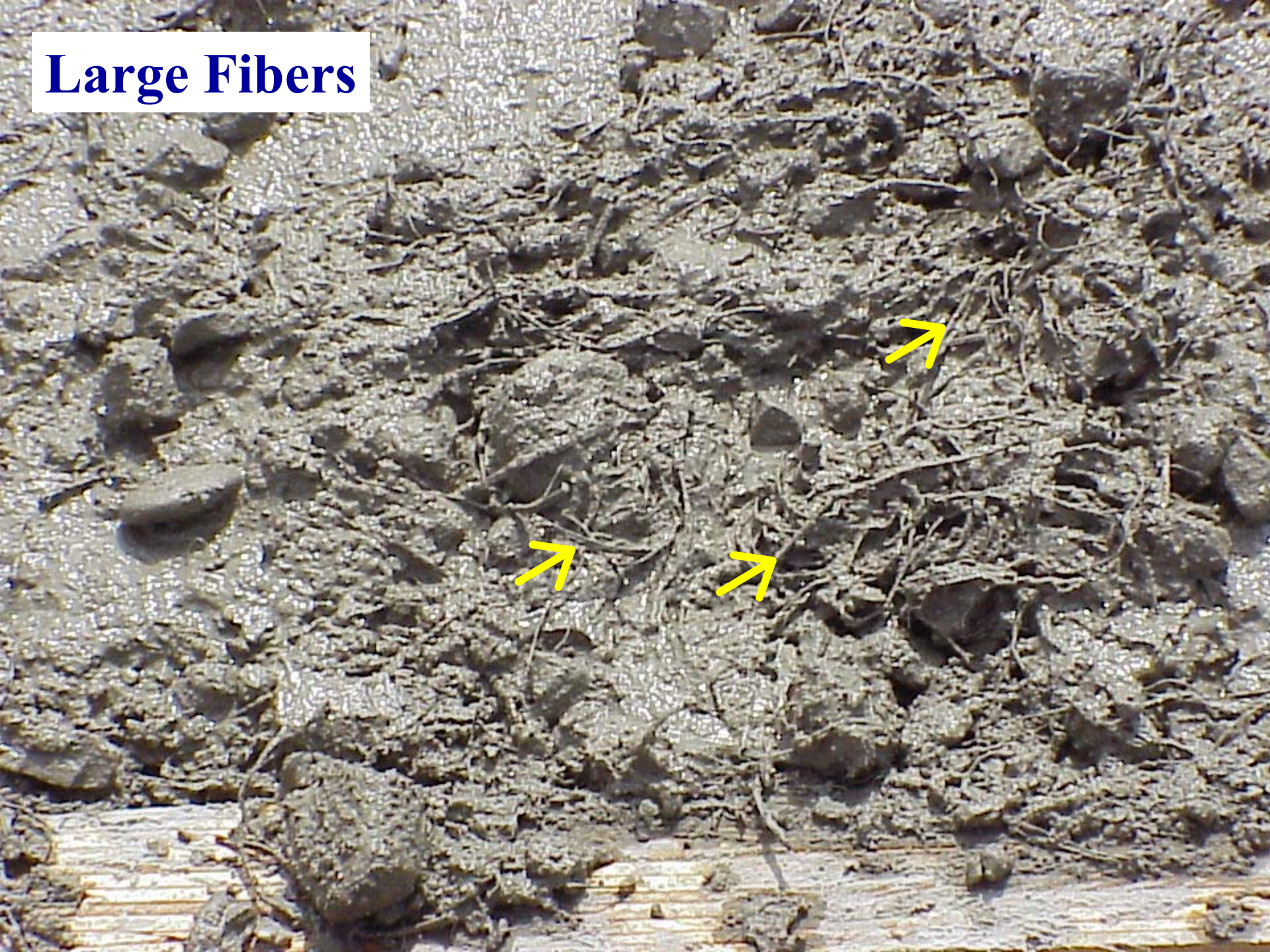


Sampling of Test Sections


Fine Fibers


Large Fibers

Construction of Test Sections

Construction of Test Sections

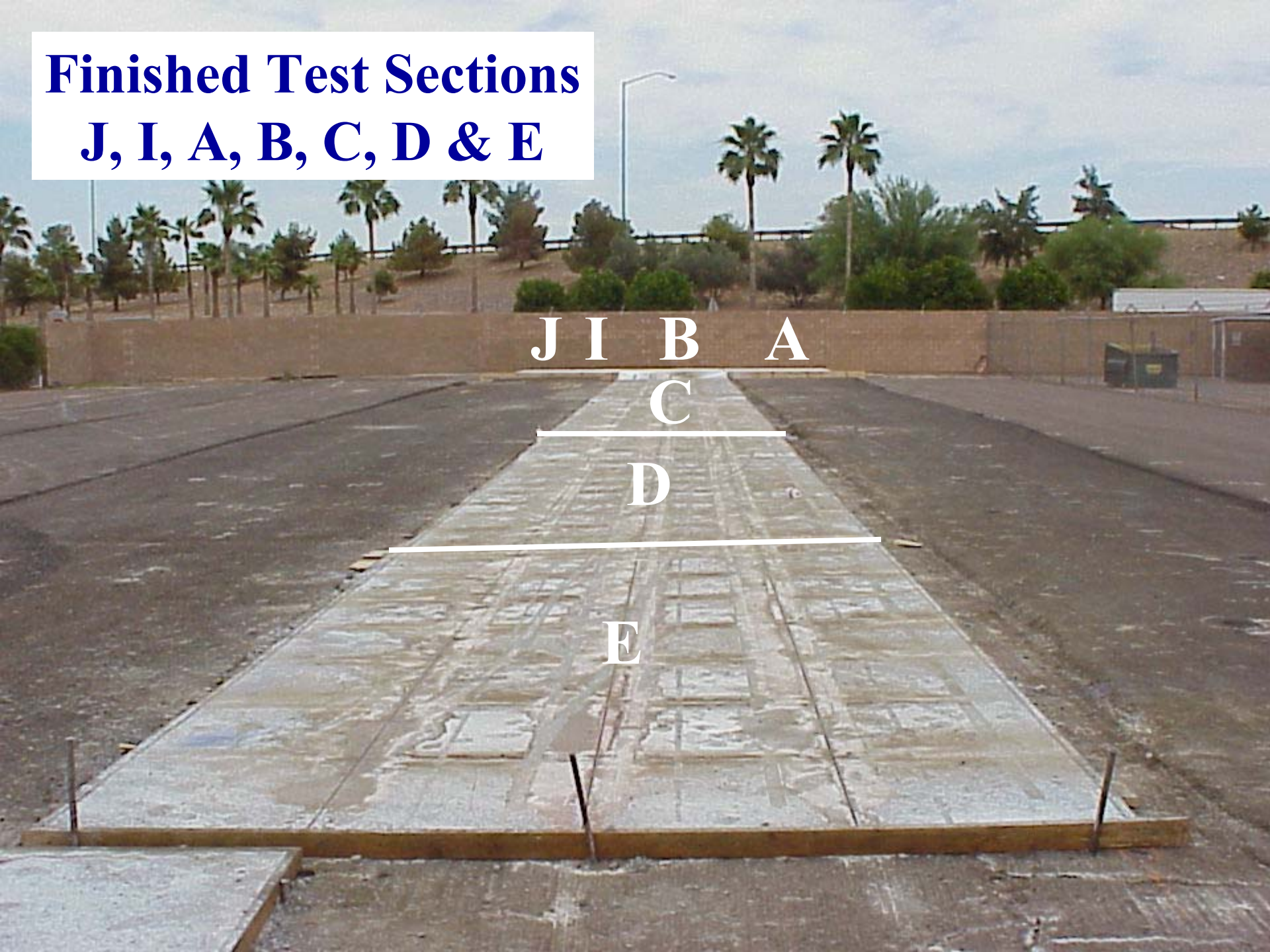
Construction of Test Sections

Addition of Curing Seal

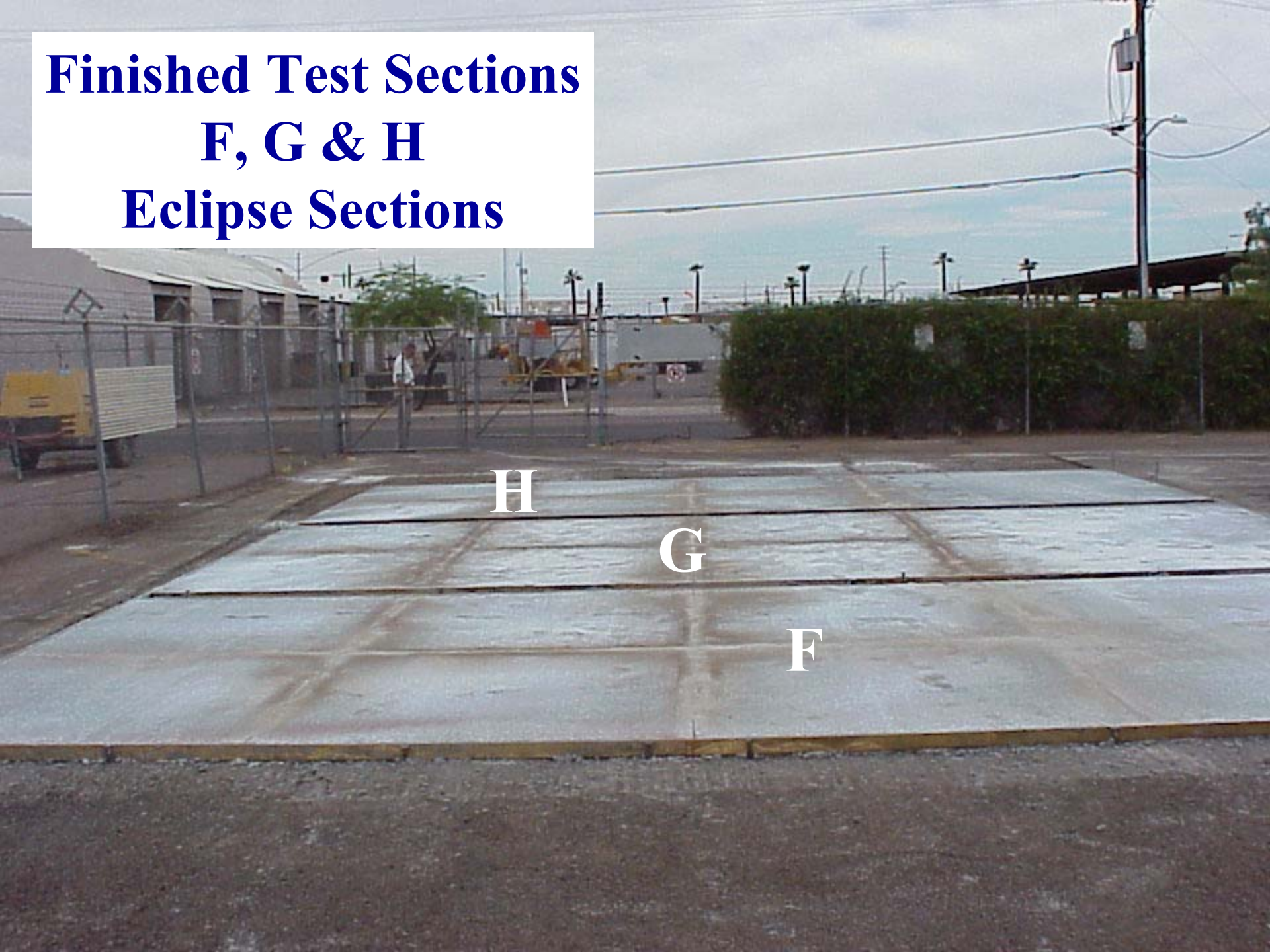
Sawcutting Sections


Cut Section

Finished Test Sections
J, I, A, B, C, D & E



Finished Test Sections
F, G & H
Eclipse Sections



Test Results

Set	Description	Densities (lb/ft^3)
A	Concrete w/ crumb rubber	138.9
B	Plain concrete	149.4
C	Conc. w/3lbs PF (F)	148.3
D - E	Conc. w/3lbs PF (F)	147.3
F	Conc. w/3lbs/cy PF (F) & Eclipse	148.5
G	Conc. w/xx lbs/cy SF (F) & Eclipse	148.6
H	Conc. w/xx lbs/cy SF (G) & Eclipse	147.6

PF = polyprop fibers

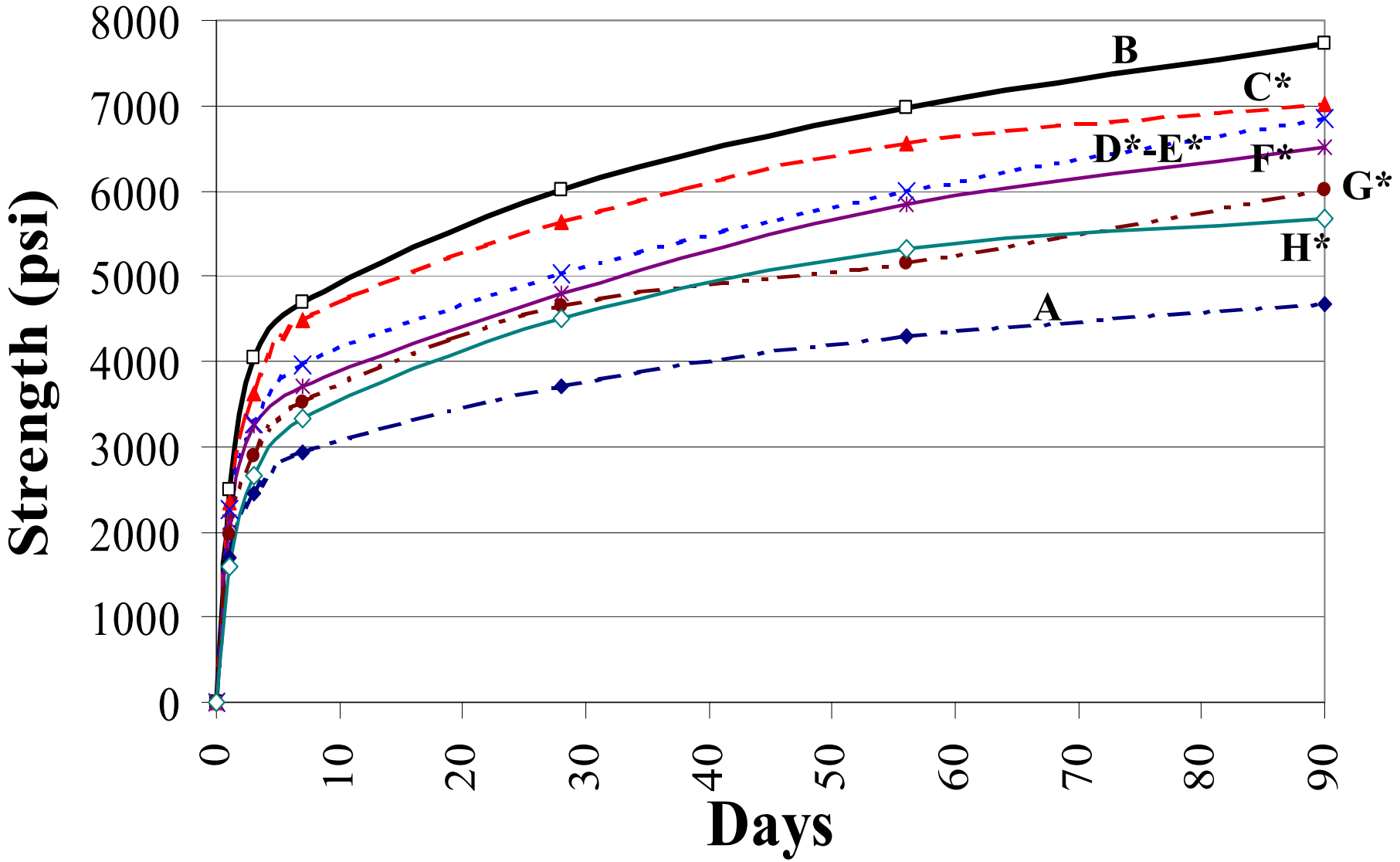
SF = structural fibers

(F) = Fibermesh

(G) = Grace

Strength Gain Chart

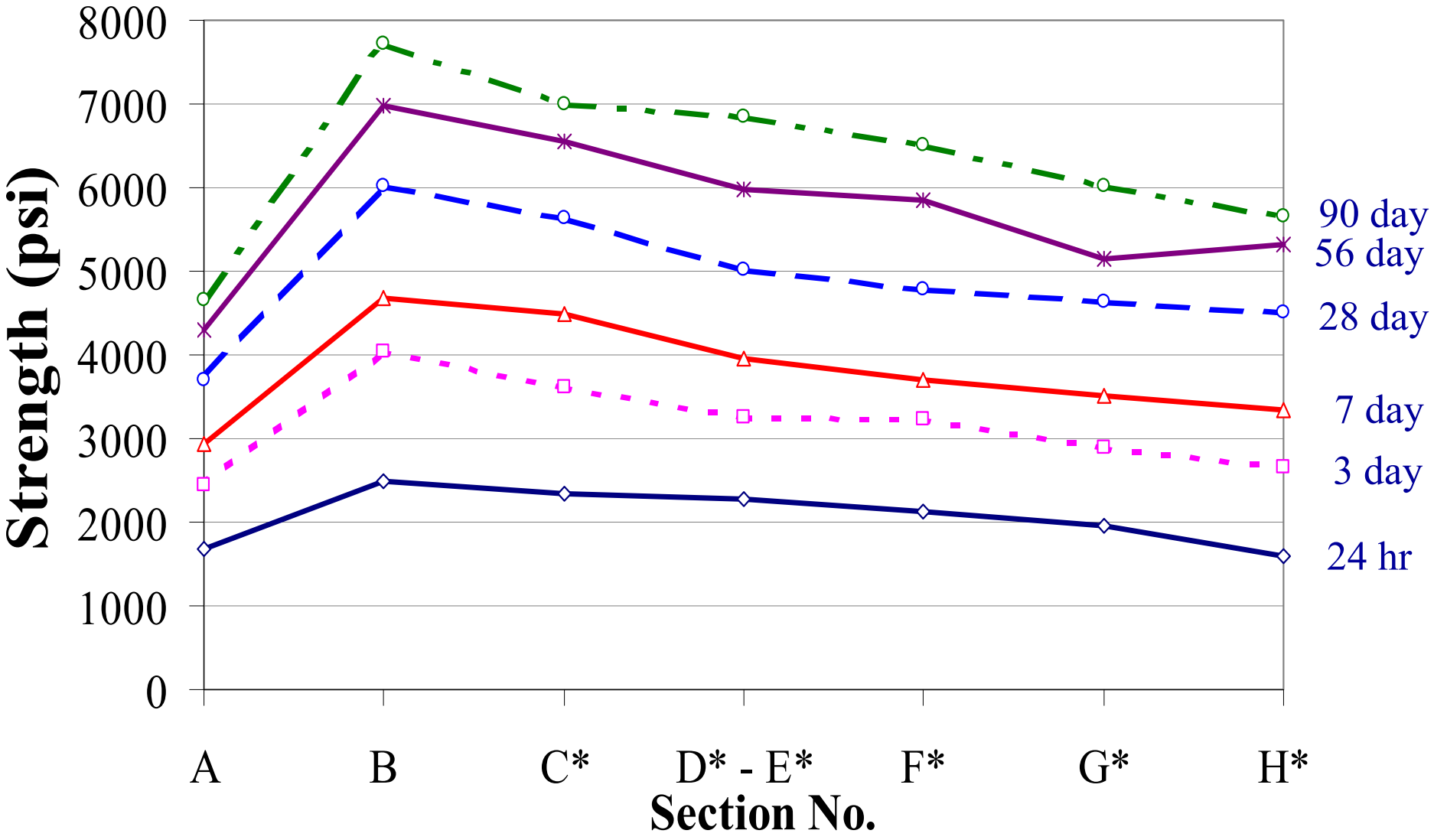
ADOT CYLINDERS



* = Lower strengths due to addition of water

Strength Comparisons

ADOT CYLINDERS



* = Lower strengths due to addition of water

CYLINDER BREAK HISTORY

	Pavement Section						
	A	B	C*	D*-E*	F*	G*	H*
24 hr Break							
ADOT Avg (psi)	1690	2500	2350	2270	2120	1960	1600
7 Day Break							
ADOT Avg (psi)	2930	4690	4480	3950	3700	3510	3340
Vulcan Avg (psi)	3000	4790	4560	4250	3920	3610	3380
28 Day Break							
ADOT Avg (psi)	3710	6020	5640	5030	4790	4640	4510
Vulcan Avg (psi)	3990	6650	6150	5620	5450	5030	4780
56 Day Break							
ADOT Avg (psi)	4290	6980	6550	5980	5850	5150	5320
Vulcan Avg (psi)	4360	7190	6580	6080	6130	5750	5350
90 Day Break							
ADOT Avg (psi)	4670	7730	7010	6850	6520	6020	5670

*=Lower strengths due to addition of water

Conclusions

- Plain, normal concrete had strongest strength
- Crumb Rubber had lowest strength & density
- Samples with fibers had lower strengths than standard concrete due to the addition of water to increase workability
- No apparent performance differences between Grace and Fibermesh structural fibers
- Samples w/ Eclipse had lower strengths than those w/o Eclipse, except for Crumb Rubber

Conclusions

- Section C (3 lbs Fibermesh polypropr fibers/CY, 4” thickness) had higher strength than thinner sections (D-3”, E-2”)
- ADOT likes the performance of the concrete
- ADOT’s Labs & Vulcan’s Labs results are similar despite different curing and testing environments
- Verifies that ADOT’s methods are reliable
- Based upon these results, future Whitetopping projects are planned